

EARTH RESEARCH FOUNDATION

ALTERNATIVE ENERGY TECHNOLOGIES

IN NEW ZEALAND

A REPORT TO

THE COMMISSION FOR THE FUTURE

JUNE 1980

NIGEL ISAACS



NZ
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P.O. BOX 56-083
AUCKLAND
NEW ZEALAND

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ALTERNATIVE ENERGY TECHNOLOGIES IN NEW ZEALAND

COMMERCIAL MANUFACTURERS

USERS

LITERATURE SURVEY

JUNE 1980

A REPORT TO: THE COMMISSION FOR THE FUTURE

NIGEL ISAACS

Alternative Energy Technologies In New Zealand

Commercial Manufacturers

This report lists those New Zealand manufacturers of the technologies commonly known as "small scale" or "alternative". It is a comprehensive list developed from the files of EARTH RESEARCH FOUNDATION and an extensive literature search. In part this has been supplemented by personal interviews and telephonic communication. Work for this report was carried out from March, 1980 to May, 1980.

The term "alternative technology" has been developed largely in response to the Western World's emphasis on large scale, "conventional" technologies. The movement towards alternative technologies therefore reflects not only the desire to develop individualistic energy supply equipment, but also to move away from the large scale solution. While there are many definitions proposed for alternative technologies, those listed in this report fall within the definition of "soft" energy technologies given by Lovins in "SOFT ENERGY PATHS"(FOE/Ballinger, 1977):

- 1) They rely on energy flows that are always there - whether we use them or not, such as the sun, wind and vegetation: on energy income, not on depletable energy capital.
- 2) They are diverse, so that as a national treasury runs on many small tax contributions, national energy supply is an aggregate of many individually modest contributions, each designed for maximum effectiveness in particular circumstances.
- 3) They are flexible and relatively low technology - which does not mean unsophisticated, but rather, easy to understand and use without esoteric skills, accessible rather than arcane.
- 4) They are matched in scale and in geographic distribution to end use energy needs, taking advantage of the free distribution of most natural energy flows.
- 5) They are matched in energy quality to end-use needs.

It is the realisation of these concepts firstly in technological experimentation and secondly in the reality of commercial equipment that requires fostering in New Zealand. The manufacturers listed in this report are in general not only producing small scale energy equipment, but are often small in scale. Their resources are exceptionally limited, and they cannot be expected to answer a continuous stream of enquiries that hold little promise of real sales. This report is therefore submitted with the request that it be used primarily as a research tool by the staff of the Commission, and not made freely available to the general public. This is not to claim that the material given is confidential, but rather that its collection in this form is unique in New Zealand.

Many of the manufacturers listed are skilled not only with respect to New Zealand, but also on an international basis. The development of New Zealand as a geographically isolated society, with a emphasis on internal self sufficiency has led to many small scale companies. However they have developed in a majority of cases without any government funding or support. In many cases the only benefit they have received has been a negative one in that they have not actively been discriminated against. As small companies they have few facilities for the production of detailed submissions to Government and para-Government grant agencies, and in some cases lack the necessary education to recognise these as a source of funding.

This report has not covered all the users of these technologies - even in a small country such as New Zealand this would be a massive task. An effort in this direction is being made by the **COMMISSION FOR THE ENVIRONMENT** who are compiling a directory of those actively involved in experimenting with small scale energy technologies on a non-commercial basis. Copies of the **Commission for the Environment's** report are available from them at no cost. This report does not attempt to duplicate their work.

A brief listing is attempted of some New Zealand users of these technologies. This does not claim to in anyway be complete but is supplied at the request of the **Commission**.

A mail survey has been undertaken of all New Zealand solar water heater manufacturers, and the material collected from this will be submitted under separate cover, when all replies have been received. The concept of such a listing for all New Zealand alternative energy technologies has been discussed with a number of manufacturers who have indicated their interest in such a publication. A separate proposal on this will be made to the **COMMISSION FOR THE FUTURE**.

Acknowledgements

With any report of this type, numerous people throughout New Zealand have helped in ensuring that all information was as up to date as possible. Special thanks are due to Lindsay Jeffs for his considerable help, and to John Noble for the use of his partnership's word processing. It is to be expected that in a rapidly changing marketplace, new manufacturers will be appearing and old ones fading away all the time. for this list to retain its usefulness it will require regular updating.

While no responsibility can be accepted for incorrect listings, users of this report are requested to inform the author of any mistakes.

Nigel Isaacs

June, 1980

PRODUCTS LISTED

Biogas (Methane) Digestors
Solar Water Heaters
Solid Fuel Burners
Water Pumps
Wind Generators
Windmills - Mechanical
WoodGasifier

USERS OF SMALL SCALE ENERGY TECHNOLOGIES

Introduction
Users - Assorted
Users - From Commission for Environment Register
Microhydroelectric plant

LITERATURE SURVEY

TOPICS

General
Biogas
Conservation
Gasifiers
Solar
Solid Fuel Burners
Water Power
Wind

BIOGAS (METHANE) DIGESTOR MANUFACTURERS

CARNAHAN-ANDERSON LTD.,
P.O. BOX 34 074,
BIRKENHEAD,
AUCKLAND.

MANGOREI INDUSTRIES LTD,
P.O. BOX 213,
NEW PLYMOUTH.

REID & HARRISON,
7 PERIA RD.,
MATAMATA.

SHELTER ENGINEERING LTD.,
P.O. BOX 10 125,
CHRISTCHURCH.

TAYLORS ENGINEERING LTD.,
P.O. BOX 191,
CHRISTCHURCH.

SOLAR WATER HEATER MANUFACTURERS

ALSOHEAT,
52A CLYDE ROAD.,
CHRISTCHURCH.

BRUGGER INDUSTRIES LTD,
PRIVATE BAG,
WAINUIOMATA.

ASSOCIATED SOLAR POWER LTD.,
82 BYRON ST.,
SYDENHAM,
CHRISTCHURCH.

COLT (N.Z.) LTD.,
P.O. BOX 4182,
CHRISTCHURCH.

COMPETITIVE PLASTICS LTD.,
P.O. BOX 7023,
SYDENHAM,
CHRISTCHURCH.

ENERGY DEVELOPMENTS LTD.,
P.O. BOX 6919,
AUCKLAND.

ENERGY SYSTEMS LTD.,
1 ROGERS AVE,
BUCKLANDS BEACH,
AUCKLAND.

GEORGE FRY & SON LTD.,
88 VICTORIA STREET,
CHRISTCHURCH.

JETSTREAM INDUSTRIES LTD.,
P.O. BOX 34 074,
BIRKENHEAD,
AUCKLAND.

KENT HEATING LTD./SOLAR35,
P.O. BOX 23 340,
PAPATOETOE,
AUCKLAND.

M & S GIBSON INDUSTRIES LTD.,
P.O. BOX 36 222,
NORTHCOTE,
AUCKLAND.

MARSHALL ENGINEERING LTD.,
P.O. BOX 91,
TAURANGA.

MONORAIL CHAIRLIFT CO.,
P.O. BOX 10 268,
WELLINGTON.

MORRISON INDUSTRIES LTD.,
PRIVATE BAG,
HASTINGS.

PETER ROBBIE LTD.,
P.O. BOX 5197,
DUNEDIN.

SOLAR PRODUCTS LTD,
209 MAIN STREET,
GREYTOWN.

SOLAR35 LTD.,
WAIPAPA,
R.D.2,
KERIKERI.

SOLARTREND ENGINEERING LTD.,
P.O. BOX 18 157,
GLEN INNES,
AUCKLAND.

SONNALL SOLAR HEATING,
P.O. BOX 83 016,
TE ATATU SOUTH,
AUCKLAND.

SUNWAY PRODUCTS LTD.,
P.O. BOX 14 201,
PANMURE,
AUCKLAND.

SUNPOWER INDUSTRIES LTD,
P.O.BOX 13 037,
AUCKLAND.

SUNPOWER POOL HEATERS LTD.,
C/- 62 NEW WINDSOR RD.,
AVONDALE,
AUCKLAND.

TRANSHEAT LTD.,
P.O. BOX 20 060,
CHRISTCHURCH.

WATERMASTER SYSTEMS LTD,
COROGLLEN,
Via,
THAMES.

ZIP HOLDINGS LTD.,
P.O. BOX 30 669,
LOWER HUTT.

FOR INFORMATION ON MAJOR MANUFACTURERS, CONTACT:
S.E.M.A.,
(SOLAR EQUIPMENT MANUFACTURERS ASSOCIATION)
P.O. BOX 9130,
WELLINGTON.

HOME BUILT LOW COST SOLAR WATER HEATER PLANS

WARRICK STUBBS,
302 RANGATIRA ROAD.,
BIRKDALE,
AUCKLAND, 10.

SOLID FUEL BURNER MANUFACTURERS

THE FOLLOWING MANUFACTURERS ARE KNOWN TO MANUFACTURE SOLID FUEL BURNERS OF A SIZE SUITABLE FOR USE IN A NEW ZEALAND HOME. THEY POSSIBLY ALSO MANUFACTURE LARGE UNITS.

ANDERSONS FOUNDRY LTD.,
P.O. BOX 19 646,
WOOLSTON,
CHRISTCHURCH.

BOSCA INDUSTRIES LTD.,
P.O. BOX 5494,
FRANKTON,
HAMILTON.

BROADY'S COAL RANGE CO.,
126 HOBSON ST,
AUCKLAND, I.

BRUGGER INDUSTRIES LTD.,
PRIVATE BAG,
WAINUIOMATA,
WELLINGTON.

CARNAHAN-ANDERSON LTD.,
P.O. BOX 34 074,
BIRKENHEAD,
AUCKLAND.

FISHER STOVES,
P.O. BOX 11 134,
ELLERSLIE,
AUCKLAND.

FRYAN ENTERPRISES,
P.O. BOX 23 214,
PAPATOETOE,
AUCKLAND.

GEORGE FRY & SON,
83 VICTORIA ST,
CHRISTCHURCH.

GILLIES MANUFACTURING CO. LTD.,
P.O. BOX 342,
OMARU.

HEATING SERVICES LTD.,
P.O. BOX 5217,
HAMILTON.

JENKINS & MACK,
P.O. BOX 56,
WELLINGTON.

KENT HEATING LTD.,
P.O. BOX 23 340,
PAPATOETOE,
AUCKLAND.

KINGSTON-CLOSE LTD.,
P.O. BOX 11 032,
SOCKBURN,
CHRISTCHURCH.

MARSHALL ENGINEERING LTD.,
P.O. BOX 91,
TAURANGA.

MASON & PORTER LTD.,
P.O. BOX 14 349,
PANMURE,
AUCKLAND.

MONT ELTHAM AGENCIES,
215 MAIN ST.,
GREYTOWN.

PRODUCTION ENGINEERING LTD.,
P.O. BOX 308,
MARTON.

R.BUCHANAN & SONS LTD.,
P.O. BOX 24 087,
EAST LINWOOD,
CHRISTCHURCH.

RADIATION (NZ) LTD.,
P.O. BOX 144,
DUNEDIN.

SOUTHLAND HEATING & MANUFACTURING CO.LTD.,
122 DON ST.,
INVERCARGILL.

STACK MANUFACTURING CO.LTD.,
P.O. BOX 67 039,
MT. EDEN,
AUCKLAND.

THE POT BELLY STOVE CO. LTD.,
P.O. BOX 40 029,
GLENFIELD,
AUCKLAND,10.

VISOR APPLIANCES (NZ) LTD,
P.O. BOX 12 760,
PENROSE,
AUCKLAND.

W.J. JANSSENS INDUSTRIES LTD.,
P.O. BOX 20 070,
GLEN EDEN,
AUCKLAND.

WARMAIRE INDUSTRIES LTD.,
P.O. BOX 12 024,
PENROSE,
AUCKLAND.

WATER MASTER SYSTEMS LTD.,
COROGLLEN,
Via,
THAMES.

THE FOLLOWING MANUFACTURERS ARE KNOWN TO MANUFACTURE
SOLID FUEL BURNERS OF A SIZE SUITABLE FOR COMMERCIAL OR INDUSTRIAL
USE. IN ONE CASE THE UNIT IS SPECIFICALLY DESIGNED FOR GRAIN DRYING.

LARGE UNITS

APPLIED COMBUSTION SYSTEMS LTD,
P.O. BOX 27,
RANGIORA,
CHRISTCHURCH.

THERMO PRODUCTS LTD,
P.O. BOX 9479,
HAMILTON.

WATERWIDE SYSTEMS LTD.,
P.O. BOX 4,
HAUMOANA,
HAWKES BAY.

WATER PUMP MANUFACTURERS

AGG-RAMS SALES & SERVICE,
38 LYON ST,
KIHIKIHI.

D.H.DAVIES LTD.,
P.O. BOX 12 029,
PENROSE,
AUCKLAND.

J.HARRISON-SMITH,
120 17TH AVE.,
TAURANGA.

JOLLY WINDMILLS CO.,
P.O. BOX 57 101,
AVONDALE,
AUCKLAND.

MACEWANS MACHINERY LTD.,
P.O. BOX 942,
DUNEDIN.

PLATA PUMPS LTD,
P.O. BOX 221,
DUNEDIN.

REID & HARRISON,
7 PERIA RD.,
MATAMATA.

WIND GENERATOR MANUFACTURERS

DEREK LITTLE,
65 WILLIAMSON AVE,
GREY LYNN,
AUCKLAND.

GALLAGHER ELECTRONICS LTD.,
P.O. BOX 5324,
FRANKTON,
HAMILTON.

N.Z.AEROSPACE INDUSTRIES LTD,
HAMILTON AIRPORT,
R.D. 2,
HAMILTON.

PEL PRODUCTS LTD.,
P.O. BOX 9533,
HAMILTON NORTH,
HAMILTON.

PYE LTD.,
P.O. BOX 2839,
AUCKLAND.

Re: Dunlite Wind Machines

SOMA WINDMILLS LTD,
P.O. BOX 94,
RUSSELL.

SPEEDRITE EQUIPMENT LTD.,
27 TOTARA ST.,
LEVIN.

WIND DEVELOPMENTS,
12 CHAYTOR ST,
TE PUKE.

WINDMILL MANUFACTURERS - MECHANICAL

B.M. INDUSTRIES LTD,
P.O. BOX 21,
SILVERDALE.

CARNAHAN-ANDERSON LTD.,
P.O.BOX 34 074,
BIRKENHEAD,
AUCKLAND.

E.T. LIENERT LTD.,
PRIVATE BAG,
PLEASANT POINT,
SOUTHCANTERBURY.

ERNEST HAYES (NZ) LTD.,
P.O. BOX 23 042,
TEMPLETON,
CHRISTCHURCH.

JOLLY WINDMILLS CO.,
P.O. BOX 57 101,
AVONDALE,
AUCKLAND.

SOUTHERN CROSS MACHINERY (N.Z.) LTD.,
P.O. BOX 1343,
PAL. NORTH.

WRIGHTSON NMA LTD.,
PRIVATE BAG,
WELLINGTON.

Re:BOWJON WIND MACHINERY

WOOD GASIFIER MANUFACTURER

FLUIDYNE R & D LTD.,
62 HENDERSON VALLEY RD.,
HENDERSON,
AUCKLAND.

USERS AND PROMOTERS OF SMALL SCALE ENERGY TECHNOLOGIES

In this section, information selected from the files of EARTH RESEARCH FOUNDATION is given on users and promoters of small scale energy technologies. It is divided into four main sections. Firstly Government activities will be briefly considered, then groups or individuals reported in the press or directly notified to EARTH RESEARCH FOUNDATION. Then those listed in the Commission for the Environment's register are listed.

Finally all those microhydroelectric plant listed by the Ministry of Energy, N.Z. Electricity is recorded.

GOVERNMENT DEPARTMENTS INTERESTED IN
SMALL SCALE ENERGY TECHNOLOGIES

There are numerous Government (and quasi-Government) departments interested in the use of small scale energy technologies. Activities however tend to centre around a small number of them, often depending more on the interest of the specific researcher rather than departmental policy.

Of particular interest are the following departments:

D.S.I.R.: The D.S.I.R. through its many departments is undertaking a wide range of experiments concerning small scale energy technologies. Of particular importance are those concerning solar energy and solid fuel burners being conducted at the Heat Transfer Laboratory, Physics and Engineering Laboratory (PEL), Gracefield, Wellington. This section is also undertaking research into the use of large scale wood pyrolysis for the production of liquid fuels.

Other divisions of potential interest include the Geothermal Laboratories based in Rotorua and Taupo, the Industrial Development Divisions at Auckland and Christchurch, and the Applied Biochemistry Division with respect to its work on ruminant digestion. This last piece of information should be tempered with the knowledge that ruminants (cows) digest their food (grass) in a manner very similar to methane digestors.

Ministry of Agriculture and Fisheries In its role of promoting development of all phases of agriculture, the M.A.F. operates Farm Advisory services as well as research establishments. These services undertake a wide range of activities - and specific interests will change depending upon the season, the location and the specific advisory officer.

Research Associations There are 12 research associations, generally funded jointly by the Government and the Industry they serve. These are:

- Building Research Association of N.Z.
- Coal Research Association of N.Z.
- N.Z. Concrete Research Association
- N.Z. Dairy Research Institute
- N.Z. Fertiliser Manufacturers Research Insitute
- N.Z. Leather and Shoe Research Association
- N.Z. Logging Industry Research Association
- Meat Industry Research Insitute of N.Z.
- N.Z. Pottery and Ceramics Research Association
- N.Z. Research Institute of Textile Services
- Wool Research Organisation of N.Z.

Of these, only the Building Research Association (B.R.A.N.Z.), and the Coal Research Association (N.Z.C.R.A.) are of particular importance to small scale energy technologies.

Ministry of Works & Development M.W.D. as the department responsible for all government buildings has undertaken a limited range of experiments with solar water heating, and solid fuel burners. This activity is generally co-ordinated through Head Office, Wellington. As of March 1979, MWD solar water heating test sites were as follows:

- Chief Post Office, Auckland
- Hostel, Otorohanga College
- Batchelor Homestead Site, Massey university
- Vogel Building, MWD Head Office Wellington
- Telephone Exchange, Courtney Place, Wellington
- Bates Building, MWD District Office, Christchurch
- MWD Workshop & Store, Washdyke
- 50 houses at the Cromwell hydro-construction village.

Housing Corporation H.C.N.Z. undertakes the construction of a large number of new dwellings each year for both government servants and government rental. They have no official testing laboratory, but have undertaken a range of demonstration tests - most often in conjunction with the D.S.I.R.. As of March 1979 they were testing solar water heaters at four locations:

Cromwell	15 units
Rotorua	8 units
Masterton	4 units
Porirua	4 units

USERS OF SMALL SCALE ENERGY TECHNOLOGIES

This information is supplied solely for the use of the **COMMISSION FOR THE FUTURE**. It is not to be released outside the **COMMISSION** except with the express permission of the author of this report. This material does not claim to be a comprehensive guide to all the users of these technologies, nor does it claim to be representative. It is a biased view of some users of these technologies. It results from an extensive review of the published literature (including daily newspapers) but cannot be guaranteed with respect to its accuracy. The people experimenting with these technologies are notorious for the speed with which they can either start or stop a particular project. Some projects may have been carried through to completion, others may have only appeared as a spark of hope in the person's eye. Activities specifically recorded in the LITERATURE SURVEY included in this report are not included in this listing. Neither are specific projects being carried out by the companies listing in the MANUFACTURING section of this report, as these also change extremely rapidly.

Further help on the current status of the users of these technologies is, in general, available from the author.



ASSORTED USERS OF SMALL SCALE ENERGY TECHNOLOGIES

- Contact: **Karel Witten-Hannah, School teacher**
Location: Lone Kauri Road, Waitakere,
Activity: Electricity generating windmill producing 1.3kW
Source: Auckland Star, 24 November, 1976
- Contact: **Northland Harbour Board, Phil Moore, Electrical overseer**
Location: Northland,
Activity: Solar cells power remote lighthouses - trial
Source: Auckland Star, 24 Jan 1977
- Contact: **A.E.P.B., Supply Engineer, Ces Galich**
Location: Auckland
Activity: Test of solar water heaters on staff houses
- Contact: **W.E.P.B./University of Auckland, Mr. M.J. Granger**
Location: Silverdale
Activity: Test of vertical axis wind-mill
Source: NZ Herald, 3/9/76
- Contact: **John Carter, Auckland Star, Chief Electrician**
Location: Shortland St., Auckland
Activity: Windmill drives car generator to produce hot water
Source: Auckland Star, 9/9/76
- Contact: **Mr. G. Gair, Minister of Energy (ex)**
Location: Wellington
Activity: see clipping
Source: N.Z. Herald, 15/12/78
- Contact: **Prof. V.J. Chapman, c/-University of Auckland**
Location: Northland
Activity: Growing sugar cane for alcohol production
Source: NZ Herald, 12/7/77
- Contact: **Bill Freeman,**
Location: Parahaki, Whangarei,
Activity: Small electrical generating windmill
Source: Northern Advocate, 2 June 1976
- Contact: **Dargaville Swimming Pool,**
Location: Dargaville,
Activity: Major installation for solar heating pool
- Contact: **Neil Cherry,**
Location: Lincoln College,
Activity: Investigating use of windmills

HERALD
Husband
That
Power
15/12/78

Press Assn Wellington

A husband in bed generates about the same heat as a 65-watt electric blanket on a low setting.

The out-going Minister of Energy, Mr Gair, came up with this tongue-in-check bit of information in a speech in Wellington yesterday.

Mr Gair said he got the information after a Wellington woman wrote to him seeking an assurance that householders with "complementary sources of heat" at night would not be charged at higher rates.

"The lady in question wrote that when her husband had been away for two nights she had observed that one husband in bed all night generated the equivalent heat of an electric blanket placed on medium heat all night," he said.

Mr Gair said he had asked the DSIR to survey the heat output of husbands compared with electric blankets.

"Their investigations so far have shown," he added, "that the standard 5ft 9in husband is the equivalent of the low setting of a 65-watt electric blanket, although further study is necessary to determine the effects of variations in the number of covers."

Contact: **Dick Chilcott,**
Location: Lincoln College,
Activity: Investigating use of wind energy

Contact: **Ken O'Connor,**
Location: Lincoln College, Grasslands Institute
Activity: NZERDC contract to investigate small hydro

Contact: **Fishing Industry Board,**
Location: Wellington,
Activity: Investigating alternative energy for vessels
Source: NZERDC

Contact: **Dave Stewart, Ministry of Agriculture**
Location: Invermay Research Centre
Activity: Biogas generators

Contact: **Don Nichols, Environmental Ethics Trust**
Location: Auckland,
Activity: Recycle plastics,paper pellets for fuel

Contact: **George Spratt,**
Location: Auckland, 9 Glendene Ave,Glendene
Activity: Electric cars,gasifier fueled car

Contact: **J.D. Hocking,**
Location: Rangitoto Farm,Bulls,
Activity: Uses Clydesdale horse in daily running of farm

Contact: **Clydesdale Ag. Museum.,**
Location: National Fielddays Area, Hamilton (Private Bag)
Activity: Clydesdale Museum keeping records of modern uses

Contact: **Peter LeBas,**
Location: Northland,
Activity: Pig farmer with homebuilt methane digester
Source: P.I.G.,(6:2) April 1976

Contact: **Ralph Sewell,**
Location: Tiki Landing,, Coromandel
Activity: Designer,builder & user of old-type windmills
Source: Own book

Contact: **Mike Brown, Dairy farmer**
Location: Ruawai,
Activity: Conservation equipment,solar water heaters etc etc

Contact: **D.J. Byers, Dept. Electrical Eng.**
Location: University of Canterbury, Senior Lecturer
Activity: Designer & Builder of electric vehicle

Contact: **Ross Forbes, School teacher**
Location: R.D. 1, Kerikeri,
Activity: Solar house

Contact: **Bruce Marks,**
Location: EARTH EXTRACT,, R.D.3, Waipu
Activity: Investigates alternative technologies

Contact: **Arthur Williamson, Prof & Dean of Engineering School**
Location: University of Canterbury, Dept. Chemical Eng.
Activity: Experiments with solar water heating

PEOPLE RECORDED IN COMMISSION FOR THE ENVIRONMENT REGISTER

Contact: **A.Bowler,**
Location: R.D.6, Minden Road, Tauranga
Activity: Designer of solar water heater
Source: Commission for the Environment Register (1978)

Contact: **R.A.Colins,**
Location: Inlet Rd., Kerikeri
Activity: Designer of solar water heater
Source: Commission for the Environment Register (1978)

Contact: **J.W.R.Currier,**
Location: National Dairy Lab., Ruakura
Activity: Solar water heater for cow sheds
Source: Commission for the Environment Register (1978)

Contact: **Ian Dopson,**
Location: 45A Brandon St., Featherston
Activity: Solar food driers, wax extractors, Savonius windmill
Source: Commission for the Environment Register (1978)

Contact: **Ross Forbes, School Teacher**
Location: Rangitane, R.D.1, Kerikeri
Activity: Energy conserving house
Source: Commission for the Environment Register (1978)

Contact: **Alec Hastwell,**
Location: Hill St., South Richmond, Nelson
Activity: Passive solar house design
Source: Commission for the Environment Register (1978)

Contact: **H.W. Hill,**
Location: c/-Kelburn Met. Office,
Activity: Solar water heater design (installed 1961)
Source: Commission for the Environment Register (1978)

Contact: **B Sellars,**
Location: 22 Shelley Crescent, Stoke, Nelson
Activity: Solar Greenhouse design & built
Source: Commission for the Environment Register (1978)

Contact: **C.J. Studman,**
Location: Agricultural Engineering Dept., Massey University
Activity: Solar water heater for cowsheds
Source: Commission for the Environment Register (1978)

Contact: **Paul Worsley,**
Location: Dairy Advisory Officer, Paeroa
Activity: Polythene pipe solar water heater for farms
Source: Commission for the Environment Register (1978)

Contact: **V.A.L.Chasteau,**
Location: Dept.Mech.Eng., University of Auckland
Activity: 5m Darrieus Windturbine
Source: Commission for the Environment Register (1978)

Contact: **Peter Holdsworth,**
Location: Te Karaka, Gisborne,
Activity: Variable geometry vertical axis windmill/generator
Source: Commission for the Environment Register (1978)

Contact: **J.G.Papesh, University of Canterbury**
Location: Department of Mechanical Engineering
Activity: Wind energy through using tree sway for extraction
Source: Commission for the Environment Register (1978)

Contact: **D.H.Taylor,**
Location: 17 Third Ave, Tauranga
Activity: Windgenerator based on car alternator
Source: Commission for the Environment Register (1978)

Contact: **W.G.Whittlestone,**
Location: Ruakura Animal Research, Centre
Activity: Remotely controlled windmill waterpumping system
Source: Commission for the Environment Register (1978)

Contact: **Clyde Bishop,**
Location: Lower Timaru Rd., R.D. 4, New Plymouth
Activity: Overshot waterwheel for pumping water to farm
Source: Commission for the Environment Register (1978)

Contact: **Nelson Thorburn,**
Location: R.D. 4, Whangarei,
Activity: Home built methane digester plant
Source: Commission for the Environment Register (1978)

Contact: **J. A. Yager,**
Location: R.D. 1, Gisborne,
Activity: Home built methane digester for manure disposal
Source: Commission for the Environment Register (1978)

Contact: **ENVIRONMENTAL ETHICS TRUST, P.O.Box 26 270**
Location: Auckland, Don Nichols
Activity: Paper pellets from old paper, recycle plastics
Source: Commission for the Environment Register (1978)

Contact: **RIVERSIDE COMMUNITY,**
Location: R.D.2,Upper Moutere,
Activity: Community sewage methane digester
Source: Commission for the Environment Register (1978)

Contact: **Ian Cave, ex-DSIR**
Location: R.D. 2,Upper Moutere, Nelson
Activity: High efficiency two chamber wood stove
Source: Commission for the Environment Register (1978)

Contact: **G.R. Katzer, DSIR**
Location: Heat Transfer Lab,, PEL,Gracefield
Activity: High efficiency wood stove design
Source: Commission for the Environment Register (1978)

Contact: **Brodie Andrews,**
Location: Wilderland Community, Whitianga
Activity: Wood gasifiers,coal gasifier for car
Source: Commission for the Environment Register (1978)

Contact: **W.J.Cousins, DSIR**
Location: PEL,, Gracefield
Activity: Wood gasifiers-large scale for synthetic liquid fuel
Source: Commission for the Environment Register (1978)

Contact: **Chris Harmer,**
Location: Hanmer Springs,
Activity: Charcol gasifier for truck
Source: Commission for the Environment Register (1978)

Contact: **L.V Walters,,**
Location: Tryphena,Great Barrier, Island
Activity: Home gas generator for running stationary engine
Source: Commission for the Environment Register (1978)

PRIVATE HYDRO-ELECTRIC SCHEMES

This list was obtained from the **Ministry of Energy, New Zealand Electricity**, in April 1978. Further inquiries since that time have not produced a more recent listing, and it can only be assumed that few, if any, new stations have been built. The list covers only private hydro-electric plant in use of less than 50kW where generation is by the use of water.

Under the act governing **New Zealand Electricity**, they are required only to license plant generating electricity from water. A nominal fee is charged making the plant subject to official inspection, and listing. Further information is available from the Commercial Division, **New Zealand Electricity**, Wellington.

PRIVATE HYDRO-ELECTRIC SCHEMES BY LOCATION

SOUTH ISLAND STATIONS

R.C. CRAIG, REEFTON.	15.0kW
R.L. GREY, WINCHESTER.	5.5kW
MOANA KOTUKU LODGE, KUMARA.	13.0kW
OMARAMA STATION, OMARAMA.	10.0kW
OTAMATAPAIO STATION, OMARAMA.	17.0kW
L.V. BALL, MATAKANUI.	2.0kW
P. & R. DISERENS, GOWAN BRIDGE.	3.0kW
D.R.B. THORPE, TAKAKA.	7.0kW
MARUIA HOT SPRINGS, MARUIA.	9.0kW
J. HURST, PENTLAND HILLS, WAIMATE.	2.0kW
J.S. FELL, NIKAU BAY, MARLBOROUGH SOUNDS.	1.1kW
W.J. LITTLE, R.D. 2, TIMARU, OTAIO GORGE.	2.5kW
D.M. LEOD, GRASSMERE, CASS.	8.0kW
I.L. KEY, MT. CREIGHTON STATION, OTAGO CENTRAL.	4.0kW
MANAPOURI-DOUBTFUL SOUND TOURIST CO., LAKE TE ANAU.	12.0kW
S.H. WEATHERALL, LAKE OHAU STATION.	14.4kW
DOBSON BROTHERS.,	

MANUKA ISLAND, MARLBOROUGH.	3.0kW
J.P. & T.L. HUNT, MT. NICHOLAS STATION, QUEENSTOWN.	16.0kW
BLUFF STATION, UPPER CLARENCE RIVER.	5.0kW
GLENTANNER STATION, LAKE PUKAKI.	12.8kW
GEOFF EAMES LTD., OHAU LODGE, LAKE OHAU.	36.0kW
A.A. URQUHART, EROWHON STATION, MT. SOMERS.	7.5kW
MT. ASPIRING CO. LTD., WANAKA.	10.8kW
K.G. PATTERSON, WHITE ROCK CAVE.	6.0kW
T.J. THOMSON, EARNSLAW STATION, GLENORCHY.	20.6kW
J.E. & P.A. PRESTLAND, MINARET STATION, LAKE WANAKA.	6.0kW
J.R. TODHUNTER, CLEARDALE, LAKE HERON.	6.0kW
G.C. URQUHART, FLOCK HILL STATION, CASS.	13.5kW
W. SCOLLAY, GLENGYLE STATION, MARLBOROUGH.	5.0kW
KELVIN HEIGHTS PROPERTY LTD., LAKE WAKATIPU.	10.0kW
J.H. CROCKFORD, WAINUI BAY, TAKAKA.	1.5kW
J.J. SINCLAIR, CAMERONS FLAT, HAAST.	25.0kW
MT AURUM STATION, QUEENSTOWN.	5.0kW
MRS. W.M. AITKEN, GLENORCHY.	3.0kW
W.I. SARGINSON, LAKE HAWEA.	10.0kW
F.J. LUCAS, CECIL PEAK STATION, LAKE WAKATIPU.	20.0kW
L. PROUTING, LAKE HERON, MT. SOMERS.	9.0kW
I.A. MCLEAN, NEVIS VALLEY, CENTRAL OTAGO.	9.5kW
A.L. BOWRELL, QUEENSTOWN.	7.5kW

A total of 39 stations are thus recorded in the South Island, with a total generating capacity of 374.2 kW. The average size is 9.6 kW.

NORTH ISLAND STATIONS

CHANNEL 9 TRANSLATOR, MT. EGMONT NTL. PARK..	27.0kW
D. PEAT, MAKAHOHO,WANGANUI.	15.0kW
D.A. REDFERN, PIRONGIA,TE AWAMUTU.	8.5kW
A.R. SCOTT, TOMBSTONE STATION,TAURANGA.	15.0kW
J.M. FOWLER, TAUPAKI ROAD,AROHENA,BAY OF PLENTY.	1.0kW

A total of 5 stations are thus recorded in the North Island, with a total generating capacity of 66.5 kW. The average size is 13.3 kW.

A total of 44 small hydro-electric generating stations are recorded for both islands, giving a total capacity of 440.7 kW, with an average plant size of 10 kW. This compares to the **New Zealand Electricity** (Government) generating capacity of 5,366 MW (1978).

The table below gives a break-down of plant size over the two islands.

SIZE	NORTH	SOUTH	TOTAL
0 - 1.9	1	5	6
3 - 4.9		4	4
5 - 6.9		7	7
7 - 9.9	1	7	8
10 - 14.9		9	9
15 - 19.9	2	3	5
20.0+	1	4	5
TOTAL	5	39	44

GENERAL

- Baird, G. "Thermal Comfort, Human Performance and Energy Conservation" Productivity + Technology pp 3-9, May 1978
- Bartlett, P. "Housing and the Coming Energy Crisis" NZ Arch 2, pp 12-17, 1978
- Birch, W. "Mr Birch Replies to Farm-made electricity queries" NZ Farmer 100:16, August 23, 1979
- Broad, H. "Horsepowering into the '80s" Straight Furrow Vol 40, No 14, August 10, 1979
- Broad, H. "Gentle Giants Ride Again" Straight Furrow Vol 38, No 25, December 1, 1978
- Forss, D.A. "Animal Traction Uses More Energy", NZ Farmer Vol 99, No 1, pp 25-26, January 12, 1979
- Gair, G. "Power Authorities Charges/Disincentives to Small Scale Energy Technologies", Mushroom 9, p 22, undated
- Harrison-Smith, J. "Heating your Home without Oil or Electricity" NZ Farmer 100:1, pp 62-63, January 11, 1979
- Hocking, J.D., Isaacs, N.P., and Jeffs, L.H. "Barriers to Small Scale Energy Technologies" Proceedings 4th NZ Energy Conf. May 1979, pp 57-64
- Hocking, J.D. Friends of the Earth Energy Policy for NZ, FOE, June 1977
- Low, G. "Alternative Energy Technology" Mushroom 2, p 19, undated
- Matthews, J.B. "Relative Costs of different-energy forms in the domestic market" Technic Group Ltd. Energy Intelligence Report, 22 November, 1978
- Mill, A. and Pitt, W.H. "Heat Loss" Home and Build, 35:6, pp 49-53, February 1973
- Morgan, J. "A sound defence of real horse power" NZ Farmer Vol 100 No 16 pp 54-55, August 23, 1979
- O'Connor, R. and O'Connor, F. "Animal Power" Mushroom 13, p 36, undated
- Peet, N.J. "Heating your Home" Soil and Health p 38, June/July 1978
- Peet, N.J. "Costs of Alternative Forms of Domestic Energy Supply - UK Travel" NZERDC Report No 22, April 1977
- Peet, N.J. et al. "Energy in New Housing - Economic and Technical Aspects of Alternative Sources of Supply" NZERDC Report No 38, Sept. 1978
- Peet, N.J. "Gas, Electricity and Coal in the Home" Cant. Econ. Bull. 619, 1978
- Peet, N.J. and Chan, B.K. "Costs of supply of household energy" Environment '77 - Proc 5, Energy pp 25-27, Canterbury Environment Centre
- Rastrick, R.J. "Heating, Fuel Systems - A Comparative Assessment" Home and Build, 35:6, pp 47-49, February 1973
- Rennie, N. "Costs in Running Hot Water" NZ Farmer, Vol 99, No 8, pp 16-17, April 27, 1978
- Seymour-Walker, K. "Low Energy Experimental Houses" NZ Energy Journal Vol 49, No 5, 25 May, 1976
- Shannon, R.J. "Geothermal Heating including group heating in Rotorua" NZ Energy Journal, Vol 49, No 6, 25 June, 1976

- Spoonley, P. "The Heavy Horse: Their Resurgence in Britain" Mushroom,
16, p 36, undated
- Stephenson, G.K. "Genuine Horsepower" NZ Farmer Vol 100, No 14, p 84,
July 26, 1979
- Struik, G.J. "Energy and Sustainable Lifestyles" ECO Conferences
Discussion Paper No 9, September 1979
- Tabor, H. "Renewable Energy Sources and the NZ Scene" Cant. Eng. Jnl. 4
Proceedings 2nd NZ Energy Conf., pp. 64-69, May 1975
- Taylor, J.D. "Concept of Energy Plantations" Farm For. 18, pp 63-68,
September 1976
- Tonybee, P.A. "Fuel for Home Heating" Cant. Econ. Bull., 617, 1978
- Walker, B.V. "Economics of Alternative Energy Supply in NZ" Proc 3rd
NZ Energy Conf., 11-26, 1977

BIOGAS

- Adam, M. "Methane from Pigs" Pork Ind. Gaz., 4:3, pp 33-36, June 1974
- Baker, N.C. "Methane Gas From Poultry Manure", 38:1, February/March 1979,
- Bogue, M. "Biogas: An Energy Source for the Future". Scope, 13:3, pp 11-13, March 1978
- Brown, B. "Biogas on a NZ Pig Farm" Pork Ind. Gaz., 6:2, April 1976
- de Lacy, H. "Methane Making in the Back Yard" NZ Farmer, 98:12, pp. 43-45, June 23, 1977
- de Lacy, H. "NZ Can Grow Its Own Energy (biogas)", NZ Farmer, 97:22, pp 20-21, November, 25, 1976.
- de Lacy, H. "Producing the Farm's Fuel on the Farm" NZ Farmer, 97:23, pp 14-16, December 1976
- Gooding, B. "Effluent Disposal - The Swiss Way" NZ Farmer, 97:7, p 19, April 8, 1976
- Gooding, B. "Power From Pigs" NZ Farmer, 97:8, pp 14-15, April 22, 1976
- Lavelidge, B. "Methane from Pig Effluent" NZ Farmer, 97:23, pp 16-18, December 9, 1976
- Offwood, D. "Turning Effluent Into Energy" NZ Farmer, 96:20, pp 25-29, October 23, 1975
- Rodden, B. "Current Trends in Effluent Disposal" Journal of Agriculture p. 34, October 1978
- Stewart, D.J. "The Economics of Production of Biogas from Specifically Grown Plant Material" Proc. 3rd NZ Energy Conf. 1977, Appendix III, pp 27-39, in Walker, B.V. "Economics of Alternative Energy Supply in N.Z."

CONSERVATION

- Trethowen, H. 'Thermal Insulation of Buildings for the Building Inspector' N.Z. Build. Insp. 7:2, pp 71-79, 1976
- Anon. 'Thermal Insulation of Houses', Build. Inf. Bull. 182
January 1976
- Anon. 'Insulating your House pays off', Consumer, 150, p 125,
May 1978
- Anon. 'The Stopawatt Insulation Blanket', Consumer 167,
p 303, November 1979
- Berry, S. 'Saving Power in the Farm Dairy', Jnl. of Agric.
pp 22-23, May 1978
- Anon. 'Strapping Cylinders to Save Water', N.Z. Plumbers Jnl.,
30:11, pp 8-11, April 1978
- Fellow, S.K. 'Hot Water Reticulation', Proc. 3rd N.Z. Energy Conf.
1977, Appendix IV, pp 57-61, 1977
- Wilkes, J.B. 'Energy Factors in Tractors', Straight Furrow, p 15,
July 19, 1978
- Anon. 'Thermal Insulation - Holding Heat in Your Home' Consumer
120, pp 212-215, August 1975
- Bartlett, P. 'Housing and the Coming Energy Crisis', N.Z. Arch. 2,
pp 12-17, 1978
- Anon. 'Thicker Insulation Saves Hot Water Cost', Building
Progress, p 3, November-December 1977
- Anon. 'The Correct Use of Foil Insulation in Walls', Build.
Inf. Bull. No. 169, August 1973
- Anon. 'Home Insulation: A Worthwhile Investment', Consumer 97,
pp 190-192, July 1973
- Cashin, B.D. 'Will it Burn, Does it Matter?' N.Z. Eng. 27, p 211,
June 1972
- McLean, R. 'Turning Down the Thermostats', Listener, 81:1892,
pp 14-15, March 13, 1976
- Anon. 'We Can't Recommend the Heat Hugga', Consumer, 154,
p 241, September 1978
- Williamson, A. 'Domestic Energy Conservation', Soil and Health, p 37,
June/July 1978
- Anon. 'BRANZ Study: Can Concrete Reduce Home Heating?'
Building Progress, pp 5-7, August 1977
- Elkis, W.J. 'A Case for Increased Insulation of Domestic Hot Water
Cylinders' N.Z. Energy Jnl., 50, pp 64-66, May 1977
- Anon. 'Reducing Heat Losses from Existing Houses', Build. Inf.
Bull. No. 201, September 1977

GASIFIERS

Andrews, B. and Hansen, D. "The Gas Producer (A Petrol Alternative)",
Mushroom, 9, p 9, undated

Rennie, N. "Cheap Fuel from new gasifier" NZ Farmer, 100:17, p 14.,
September 13, 1979.

Rennie, N. "Fluidyne Gasifer now in Production", NZ Farmer, 100:19,
p 121, October 11, 1979

SOLAR

- McKnight, J.D. 'A Design Method for Solar Water Heating Systems', N.Z. Energy Jnl. 52, pp 10-13, February 1979
- Studman, C. 'Massey Solar Dairy After Three Years', N.Z. Farmer 100:5, pp 30-33, March 8, 1979
- Rennie, N. 'Test on Waikato Dairy Farm - Solar Water Heating for Twice-a-Day-Cleaning', N.Z. Farmer, 100:6, pp 30-31, March 22, 1979
- Callaghan, P. 'Siting Solar Panels for Dairy Hot Water', N.Z. Farmer, 100:14, pp 49-50, July 26, 1979
- Mautner, J. 'Solar Energy, Is It a Viable Component of our Energy Budget?' Scope, 13:4, pp 12-13, June 1978
- Benseman, R.F. 'Solar Energy - the Way Ahead', N.Z. Energy Jnl. 51, pp 142-145, September 1978
- Hill, D.J. and Painter, D.J. 'Biogas and Solar Energy Collectors for Dairy Farms?', Linc. Farm Conf. Proc. pp 201-215, 1977
- Stevens, G. 'Solar Heated House, School of Architecture, Auckland 1976' N.Z. Arch. 2, pp 24-27, 1978
- Galich, C.G. 'Solar Water Heating', N.Z. Energy Jnl. 51, pp 146-150, September 1978
- Little, C. 'New Solar Heat Collector System', N.Z. Farmer, 98:17, pp 79-80, September 8, 1972
- Harrison-Smith, J.L. 'Trials with a Solar Heater', N.Z. Farmer 98:11, pp 93-95, June 9, 1977
- Anon. 'Solar Control Glass Histories', Build. Inf. Bull. 190, August 1976
- Rogers-Jenkins, H. 'Series of Articles on 'How to Construct a Solar Heater at Minimal Cost'', N.Z. Jnl. Agric., 132:1, pp 47-50, January 1976; 132:2, pp 53-56, February 1976; 132:3, pp 48-51, March 1976; 132:4, pp 74-78, April 1976; 132:5, pp 73-76, May 1976
- Cook, I. 'A Plug for the Sun', Designscape, 79, pp 22-28, April 1976
- Westwood, D.C. & Currier, J. 'The Heat is on - Study of Solar Water Heating in the Cowshed', N.Z. Farmer, 96:19, pp 18-19, October 9, 1975
- Rennie, N. 'Massey Dairy's Solar Heating System', N.Z. Farmer, 96:20, pp 16-19, October 23, 1975
- Rogers-Jenkins, H. 'Solar Heating Construction Problems', Plumbing Rev. 8, pp 10-11, September 1974; also November 1974, Jan/Feb 1975 and March 1975
- Allen, G.L. 'Solar House Space Heating', N.Z. Energy Jnl. 48, pp 250-252, November 1975
- Anon. 'Solar Water Heaters - Sunshine will Pay Off, but don't expect a profit' Consumer, 114, pp 16-19, January/February 1975
- Parvin, B. 'The Sun, the Wind and the Warrior', N.Z. Energy Jnl. 48, pp 245-247, November 1975
- Morse, R.N. 'Solar Energy as a Major Source of Power', Cant. Eng. Jnl. 4 Proc. 2nd N.Z. Energy Conference, May 1975, p 70
- Benseman, R.F. 'Solar Energy Development Overseas', N.Z. Eng. 30, pp 157-162, June 1975
- Hollingworth, N. 'An Introduction to Solar Heating', Factory Manag., 5:3, pp 10-11, March 1974

- Hopkins, C.E.C. 'More on Solar Heating', N.Z. Farmer, 95:15, pp 22-23
- Rogers-Jenkins, H. 'A New Look at Solar Heating', N.Z. Plumbing Rev. 11:2, pp 5-7, February 1974
- Rogers-Jenkins, H. 'Reducing Cost of Solar Heated Water', N.Z. Plumbing Rev. 11:4, pp 11-13, April 1974
- Rogers-Jenkins, H. 'Using Polythene Hose in Solar Heaters', N.Z. Plumbing Rev. 11:5, pp 10-11, May 1974
- Rogers-Jenkins, H. 'Making a Solar Heating Absorber', N.Z. Plumbing Rev. 11:6, pp 8-9, June 1974
- Rogers-Jenkins, H. 'Installing the Solar Heating System', N.Z. Plumbing Rev., 11:8, August 1974
- Rogers-Jenkins, H. 'Towards the Completed Solar Heater', N.Z. Plumbing Rev., 11:11, pp 17-18, November 1974
- King, D.W. 'Performance Data for a Swimming Pool Solar Water Heater at Rangiora', N.Z. Eng. 29, pp 234-235, August 1974
- Hollingworth, N. 'Solar Heating for Hot Water', Home and Build, 36:6, pp 9-11, February 1974
- Barwell, B. 'Using the Sun to Heat Water', N.Z. Farmer, 95:6, pp 18-20, March 20, 1974
- Barwell, B. 'Can the Sun Save You Money in the Cowshed?', N.Z. Farmer, 95:7, pp 8-10, April 11, 1974
- Ward, G.T. 'Solar and other Renewable Energy Resources - Global and N.Z. Prospects', Energy in N.Z., Proc. 1st N.Z. Energy Conference, pp 35-37, 1974
- Keefe, J. 'The Solar Battery Maintainer', Sea Spray, 29:9, 104, October 1974
- Benseman, R.F. 'Solar Energy for N.Z.', N.Z. Listener, 76:1803, pp 2-3, June 8, 1974
- Morse, R. 'Sun Power: Promise of a Never Ending Energy Supply', Home and Build., 36:9, pp 11-15, May 1974
- Morse, R. 'Solar Energy', Home and Build., 36:10, pp 51-53, June 1974
- Johnson, R. 'Hot Water from the Solar Heater - How it Works', N.Z. Farmer, 94:15, August 1973, pp 13-15
- Johnson, R. 'The Solar Heater - How to Build It', N.Z. Farmer, 94:16, pp 39-45, August 23, 1973
- Dopson, I. 'Solar Heating - Trapping the Sun's Rays', N.Z. Farmer, 94:3, pp 26-27, February 8, 1973
- Anon. 'Why not use Solar Energy?', Ind. Dev. 3:1, pp 3-4, March 1973
- Page, G.G. 'Quality of Potable Water from Building Services in Auckland - Some Design Aspects', N.Z. Eng. 28, pp 111-114, April 1973
- Worsley, P. 'Solar Heating Systems', Jnl. of Agric., p 74, August 1978
- Benseman, R.F. 'DSIR Solar Energy Research: Report on Activities of the Physics and Engineering Laboratory in the Period 1974-77', P.E.L. Report to NZERDC

- Jones, K. 'Integrated Solar Water Heating System', L.J. Fisher & Co. Ltd., Report to the New Zealand Energy Research and Development Committee, Contract No. 3029
- Kendall, O. 'Design of Domestic Solar Water Heating Systems', Zip Holdings Ltd., Report to the New Zealand Energy Research and Development Committee, Contract No. 3059
- Parker, G.R. 'Solar Energy and Domestic Application', Cant. Env. Jnl. pp 5-11, November 1977
- Anon. 'Solar Heating: A Rip-off or a Pay-off?' N.Z. Plumbers Jnl. pp 12-15, July 1978
- Anon. 'The Davis Solar Energy Project', N.Z. Plumbers Jnl. 30:11, pp 8-11, April 1978
- Benseman, R.F. 'Solar Energy' (Appendix III to paper by B.V. Walker) Proc. 3rd N.Z. Energy Conf. 1977, pp 48-56, 1977
- Benseman, R.F. 'Solar Energy - A Complete Energy Substitute', Environment '77, Proceedings 5, Energy, (Ed. N.J. Peet), Environment Centre, (Canterbury) , 1977
- Anon. 'Large Solar Installations at Christchurch', Building Progress, p 21, March-April 1978
- Anon. 'Let's Pour a Little Cold Water on Wild Solar Heating Ideas', N.Z. Plumbing Rev. 11, July 1974
- Palmer, G.H. 'Domestic Hot Water from Solar Energy', DSIR, Auckland Industrial Development Division, 1974, (LP 16)
- Hills, D.A. & Allen, G.L. DSIR, Christchurch Industrial Development Division, 1974, Technical Leaflet 1
- Anon. 'Solar Heating - A Simple System', Soil and Health, p 18, August/September 1978
- Forbes, R. 'An Energy Conserving House', N.Z. Environment, Vol. 17, pp 3-7, August 1977
- Roger, W. 'Energy Saving with Solar Heat - The Brace Solar Greenhouse', Soil and Health 37:2, pp 38-39, June/July 1978
- Benseman, R.F. 'Solar Energy - A Complete Energy Substitute', Soil and Health, April/May 1977
- Parker, G.J. 'Solar Energy... and Domestic Appliances', Soil and Health, pp 38-39, October/November 1976
- Roger, W. 'Solar Heating - A Simple System', Soil and Health, 37:4, p 19, 1978
- Grey, A. 'Solar Food Drier', Mushroom, 9, p 7, undated
- Editorial 'Withus or Aginus', Mushroom, 9, p 22, undated
- Stevens, D.G. 'Designing for Solar Heating in N.Z.', Austr. and N.Z. Assoc. Advanc. Sci (ANZAAS) 49th Cong. Section 4, January 1979
- Luxton, R.E. 'The Solar Bond of the Energy Spectrum - Some Legal Aspects', Austr. and N.Z. Assoc. Advanc. Sci (ANZAAS) 49th Cong. Section 5, January 1979
- Green, D.J. 'Energy Savings from Domestic Solar Water Heaters', Austr. and N.Z. Assoc. Advanc. Sci (ANZAAS) 49th Cong. Section 3, January 1979

- Benseman, R.F. 'Solar Energy - What are We Buying?' Austr. and N.Z. Assoc Advanc Sci (ANZAAS) 49th Cong. Section 31, January 1979
- Forbes, R.D. 'Alternative Energy Conserving Technologies in the Existing Household', Proc. 4th N.Z. Energy Conf., pp 65-74, May 1979
- Stevens, G. 'Solar Heated Buildings', Proc. 4th N.Z. Energy Conf. pp 136-142, May 1979
- Jessup, G. 'Solar Energy in N.Z. Industry', Proc. 4th N.Z. Energy Conf. pp 365-373, May 1979
- Benseman, R. 'Solar Energy Development in the USA', NZERDC, Report No. 1, December 1974
- Shaw, R.A. 'Residential Solar Space Heating in N.Z.', NZERDC Report No. 39
- Stevens, D.G. 'Solar Plans and Sections', NZERDC Report No. P.9
- Stevens, D.G. 'Buildings in the Summer Sun', NZERDC Report No. P.11
- Benseman, R.F. 'Solar Energy Can be Self-Supporting Long-Term Energy Storage', N.Z. Energy Jnl. 50, pp 17-18, February 1977
- Parvin, B. 'Solar Energy for Domestic Hot Water', N.Z. Energy Jnl. 50, p 13, February 1977
- Chapple, G. 'Capturing the Sun', Listener, 86:1956, pp 18-19, June 18, 1977
- Anon. 'New Single Panel Solar Heating Unit in N.Z.' Build. Prog, 42:2, pp 5-9, March/April 1977
- Spedding, P.L., Allen, M.L., and Brow, D. "The Solar Build Concept for the Supply of Hot Water", N.Z. Eng. 32, pp 126-131, June 1977, Addendum: Page 211, September 1977
- King, D. 'Solar Heating', N.Z. Draughtsman, 14:3, pp 17-21, September 1977
- Anon. 'Solar System', Designscape 96: pp 32-33, October 1977
- Anon. 'Solar Water Heaters Application', Build. Inf. Bull. No. 196, BRANZ, March 1977
- Anon. 'Solar Water Heaters: Installation', Build Inf. Bull. No. 197A, BRANZ, March 1977 and No. 197B, July 1977
- Galich, C.G. 'Solar Water Heating', N.Z. Energy Jnl. 50, pp 124-126, August 1977; Elect Supply Eng Inst Trans. 47, pp 20-22, 1977, Discussion: pp 23-26
- Anon. 'Solar Water Heating - Economical in the Long Run', Consumer, 137, pp 42-43, March 1977
- Anon. 'Industry Paves the Way with Solar Energy', Soil and Health 38:2, p 17, April/May 1979
- Berryman, W. 'Solar energy industry running out of steam', National Business Review, February 7, 1979
- Anon. 'Solar 50-50 So Far', N.Z. Energy Jnl. 51:9, p 141, 25 September, 1978
- Anon. 'Government's solar water-heater loan scheme', N.Z. Energy Jnl. 51:9, p 154, 25 September, 1978
- Anon. 'Guidelines for combined electric and solar water-heating', N.Z. Energy Jnl. 51:9, p 154, 25 September, 1978
- Anon. 'Solar products and service', N.Z. Energy Jnl. 51:9, 25 September, 1978
- Gair, G. 'Harnessing Solar Energy in N.Z.', N.Z. Energy Jnl. 51:5, p 61, 25 May, 1978

SOLID FUEL

- 'Fireside Topics' Build. Inf. Bull, 193, December 1976
- 'Should you buy a freestanding open fireplace? - Many likeable features but value for money debatable', Consumer 138, pp 80-83, April 1977
- 'Space Heating Venture', N.Z. Coal, Winter 77, pp 14-15
- Thomson, A.P. 'Forestry, forest products and energy', N.Z. J. Forestry, 22: pp 193-220, 1977
- 'Big Swing Back to Solid Fuel Space Heaters', N.Z. Coal, Autumn 1977
- 'N.Z. leads in pulverised fuel firing', N.Z. Coal, 21:2 pp 2-3, Autumn 1977
- 'Solid Fuel Burning Appliances', N.Z. Coal, Spring '77, pp 18-19
- Toynbee, P.A. 'Coal in our energy economy', N.Z. Energy J. 47: pp 198-201, December 1974
- Tait, W. 'A New Look for Coal Firing', Ind Dev. 1, pp 6-8, March 1974
- 'Wet-back and waterheating', N.Z. Coal, 16:3, pp 5-7, March 1972
- Toynbee, P.A. 'Coal responds to challenge for modern domestic warmth' N.Z. Coal, 17:4, pp 2-5, Spring 1973
- Tonybee, P.A. 'Solid Fuel' Home and Build 35:6, pp 58-61, February 1973
- Toynbee, P.A. 'Modern Uses of Coal', Home and Build, 35:6, pp 79-81, February 1973
- 'New Coal Heaters Reduce Cost and Pollution', N.Z. Coal, 17:4, pp 6-7 Spring 1973
- Shannon, D.V. & Welsh, D. 'The Rayburn Smokeeater - a novel non-polluting coal heater under test', Factory Manag., 4:2, pp 11-17, February 1973
- 'Rebirth of the Pot Belly Stove', N.Z. Coal, Autumn 1978, pp 29-30
- 'Little Dorritt has ready market', N.Z. Coal, pp 31-32, Autumn 1978
- 'Warmaire 'Heat Catcher' ', N.Z. Coal, p 36, Autumn 1978
- 'Solid Fuel Stove: the Stack Stove Revival', Designscape 101, pp 9-11, April 1978
- Boshier, A.G. 'Stoves with Wetback causing concern', N.Z. Plumbers J. p 13, August 1978
- Barr, N. 'Stoking up with wood', N.Z. Farmer, Vol. 99, No. 5, p 63, March 9, 1978
- Barr, N. 'Grate way to turn wood to energy', N.Z. Farmer, Vol. 99, No. 17, pp 102-103, September 14, 1978
- Cave, I.D. 'Doing a Long Slow Burn!', Straight Furrow, p 9, May 24, 1978
- 'Solid Fuel Stoves', Designscape, No. 101, April 9, 1978
- Douglas, R.T. and Milne, W. 'Coal Firing and the Clean Air Act', N.Z. Coal, 20:3, pp 4-8, Winter 1976
- Lowry, J.B. 'Forests, energy and the N.Z. Home', N.Z. Energy J. 49: pp 22-25, February 1976
- 'What's available to keep the home fires burning?' A buying guide to solid-fuel space heaters' Consumer 152, pp 188-191, July 1978
- 'Paper Logs in the open fireplace', Consumer 154, p 255, September 1978
- Cave, I.D. 'A clean wood burner' D.S.I.R. P.E.L. Report 552,

- Katzer, G. and Ward, A.F. 'A design of a domestic wood burning stove'
D.S.I.R. P.E.L. Report 631
- Cousins, W.J. 'A theoretical study of wood gasification processes'
N.Z. J. Sc. 21, pp 175-183, June 1978
- Rennie, N. 'Wood Burner heats new rotary shed' N.Z. Farmer, 100:18
pp 17-19
- 'The Rayburn CB 34: new smokeless domestic heating' N.Z. Coal 17:1,
pp 4-5, Winter 1972, 'The smoke-eater' - Rayburn CB 34 evaluated, p 6-7
- Cousins, W.J. 'Gasification of Wood: Principles and Prospects',
Mushroom 10, p 32
- Cave, I.D. 'Efficient Domestic Wood Burning', Mushroom 9, p 15
- Hansen, D. 'Renovation of Stoves', Mushroom 9, pp 18-19
- Barr, N. 'On Farm Wood Production' Paper to the 49th ANZAAS Congress,
Auckland, January 1979

WATER POWER

- Gooding, B. 'Water Power', N.Z. Farmer, 97:14, pp 17-19, July 22, 1976
- Harrison-Smith, J.L. 'The Power of the Small Stream', N.Z. Farmer, 97:15, pp 25-29, August 12, 1976
- Harrison-Smith, J.L. 'Measuring Flow', N.Z. Farmer 97:16, pp 36-37, August 26, 1976
- Harrison-Smith, J.L. 'Main Types of Water Motor', N.Z. Farmer, 97:18, pp 27-29, September 23, 1976
- Harrison-Smith, J.L. 'Designing a Pipeline', N.Z. Farmer 97:19, pp 61-3, October 14, 1976
- Mackay, J. 'Water, the Wonder Fuel', Town Plann Q No. 53, p 7, December 1978
- Harrison-Smith, J.L. 'Simple Water Turbine', N.Z. Farmer 99:23, pp 101-05, December 14, 1978
- Harrison-Smith, J.L. 'Using Water as a Source of Power', N.Z. Farmer, 95:12, pp 38-39, July 27, 1974
- Harrison-Smith, J.L. 'Pumping Scheme Based on Impeller Turbine', N.Z. Farmer, 98:5, pp 57-9, March 10, 1977
- Harrison-Smith, J.L. 'Hydraulic Rams', N.Z. Farmer, 98:11, pp 53-77, June 9, 1977
- Harrison-Smith, J.L. 'Electricity - Another Farm Product?' N.Z. Farmer pp 33-34, November 23, 1978
- Harrison-Smith, J.L. 'The Case for Small Hydros', N.Z. Farmer, March 9, 1978
- Hirsch, S. 'Small, Farm-Scale Alternative Energy Sources', N.Z. Farmer, pp 37-38, August 10, 1978
- Daker, A.J. 'Water Power on the Farm: Design Manual' Agric. Engineering Section, M.A..F., Hamilton, February 1979.
- Scott, D. 'Small Hydro Schemes & Fisheries', N.Z. Eng, pp 178-179, August 15, 1978
- Finnie, J. 'Decentralised Power in South Westland', Canterbury Env. Jnl. p 13, August 1978
- Anon. 'New Ways of Pumping Water', Straight Furrow, pp 10-11, March 22, 1978
- Goulding, B. 'The Clunk...Clunk...Clunk of a Hydraulic Ram', N.Z. Farmer, 97:21, pp 18-19, November 11, 1976
- McLeary, R and Leyland, B.W. 'Small Hydro Potential in N.Z.' N.Z. Energy Jnl. 49, pp 4-5, January 1976
- Steincamp, J. 'Small Hydros: A Powerful Alternative', N.Z. Listener, 82:1915, pp 18-19, August 21, 1976
- Howes, R.C.W. 'The Supply Authorities Involvement in the Development of Small Hydro Generation Schemes', N.Z. Energy Jnl. 49, pp 123-30, August 1976

WIND

- Little, C. 'Going with the Wind', N.Z. Farmer Vol. 100, No. 5, pp 13-14, March 8, 1979
- Neketai, R. '200 Watt Wind Generator', Mushroom 14, pp 19-25
- Cherry, N. 'Wind Energy Resource Assessment', NZERDC Report No. 8, April 1976
- Dawber, K.R. & Edwards, P.J. 'The Wind Energy Resource in Otago', NZERDC Report p 12
- Edwards, P.J. et al. 'Otago Wind Energy Resource Survey - Phase III - Data Acquisition and Processing', NZERDC Report, p 13
- Clarke, R.M. 'Wind Power - its potential for energy saving', N.Z. Eng. 30 pp 261-4, September 1975
- Rennie, N. 'Windmill Water Pump', N.Z. Farmer, March 23, 1978
- Leighton, J. 'Wind in the North', N.Z. Farmer, April 27, 1978, p 48
- Diesendorf, M. 'A Community Use of Wind Power', ANZAAS 49th Congress, Proc. 1979, Section 5.
- Sayers, K.H. 'Cheap Wind Machines in Remote Areas', ANZAAS 49th Congress Proc. 1979, Section 5
- Lindley, D. 'Some Aspects of Wind Energy Conversion and the environment' Environment 77 Proceedings 5 Energy, p 59, Environment Centre (Cant.) Inc.
- Anon. 'New Forms of Energy: Solar Energy + Wind Power', Dairy Annual, pp 163-73, 1976
- Harrison-Smith, J. 'Wind Power', N.Z. Farmer 98, No. 15, pp 84-5, August 11, 1977
- Chilcott, R.E. 'Wind Energy Utilisation - Prospects for N.Z.' Proceedings of the 2nd N.Z. Energy Conf. 1975, Cant. Eng J. May 1975, pp 72-75
- Lindley, D. 'Wind Energy - its Practical Potential', Soil and Health, August/September 1976, pp 38-39
- Sewell, R. 'Windmills for Home Power', Waterwheel No. 17, pp 1-2, October 1978
- Pattinson, J. 'Exchange wind energy for electric energy', Break-in 49, pp 209-13, January 1976
- Dodson, F. 'Harnessing the Wind', N.Z. J Agric. 132:2, p 7, February 1976
- Chilcott, R.E. 'Wind Energy Utilisation - N.Z.'s prospects', N.Z. Energy J 49, pp 40-42, November 1976
- Anon. 'Wind - selecting and protecting a site', Build Inf. Bull. 191, December 1976
- Falconer, I.R. 'Windmill Powers farm stock water scheme', N.Z. J Agric 128, No. 4, pp 33-34, April 1976
- Lincoln College, Department of Agricultural Engineering, Progress Report to September 1978 on UGC Grants: Performance Characteristics of Wind Turbines for Advanced Farm, Rural and Remote Use

